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(54) Title: METHOD AND APPARATUS FOR PRIORITY QUEUING OF TELEPHONE CALLS		
(57) Abstract		
A PBX/automatic call distributor (ACD) system (12) allows callers to exercise control over their rank order within a phone queue. The ACD (12) accesses a call database (62) and develops offers to be made to callers, based upon a caller reaching a particular position in a queue or at a position at which the call is first placed in the queue. An interactive voice response unit (IVRU) (14) is employed to offer a caller a chance to move up in the queue in return for a payment. If the caller wishes to accept the offer, the caller responds by using the touch-tone keys of his/her telephone and entering a credit card number, an account number, or indicating some other method of payment. The ACD (12) then changes the rank order of the caller's call within the phone queue and alters the rank position of other calls within the queue, accordingly.		

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**Method and Apparatus for Priority Queuing of  
Telephone Calls**

**FIELD OF THE INVENTION**

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The present invention relates to a system and method for controlling the queuing of incoming telephone calls and, more particularly, to a system and method for enabling a caller to alter an assigned position of a call in a 10 queue.

**BACKGROUND OF THE INVENTION**

As more and more companies offer telephone access to 15 their customer service, sales and support staffs, problems associated with waiting on hold have grown. Such problems include, for example, excessively long waits, full queues that can not accept additional callers, and accidental disconnects. These problems have engendered a high level 20 of frustration and ill will amongst callers. Some companies now routinely inform calling customers on hold how long a current wait is expected to last before a service representative will be available to take the call.

25 Some companies offer various levels of speed-of-answer services to their customer base. This is especially important where time-on-hold can tie up valuable business activities of the caller. Thus, a company might offer one telephone number for service which guarantees no more than 30 a five-minute wait, and another less expensive number which guarantees that an agent will be available in no more than a 15 minute wait. Incoming callers are thus charged more for the shorter response guarantee time than for calls with a longer response guarantee time.

35

To implement an automatic call answering/queuing system of the type described above, manufacturers offer a range of products. Ordinarily, automatic call answering systems include a private branch exchange (PBX) which 40 processes an incoming call and identifies the number dialed

via a dialed number identification service function (DNIS). Once that information is stored, the PBX checks a routing database for DNIS routing instructions and routes the call to an automatic call distributor (ACD). The ACD logs each 5 call in memory and assigns each call a rank, based on the order in which the call arrived. If there are currently N calls in a queue, the ACD normally assigns a next call received from the PBX to position N+1 in the queue.

10 When the PBX indicates to the ACD that an agent is available to answer a call, the call resident at the top of the queue in the ACD is removed and sent to the PBX, which takes the corresponding incoming line off hold and routes the call to the available agent. The ACD then moves up each 15 call in the queue and the process continues.

If the system is provided with an automatic voice response capability, it includes an interactive voice response unit (IVRU). The IVRU is utilized to 20 intermittently communicate with incoming callers, indicating position in the queue and waiting time until the call is expected to be answered.

U.S. Patent 5,020,095 to Morganstein et al. describes 25 a call processing apparatus which queues calls that are waiting to be connected to a service position. The apparatus calculates a queue position and wait time and transmits the queue data to the calling party. U.S. Patent 5,444,774 to Friedes describes an interactive queuing 30 system for a call center and collects initial information from the caller while the call is in the holding queue. The information input by the caller enables the apparatus to query a database and to retrieve additional information needed to service the call. That information is then 35 displayed to a next available agent as the call is received by that agent.

U.S. Patent 5,561,707 to Katz describes a telephone interface system which is adapted to select or qualify a 40 set of callers, acquire data from the callers in the set

and statistically analyze the acquired data. U.S. Patent 4,788,715 to Lee describes an automatic call distributor system wherein calls waiting in a queue are informed of expected wait time until connection to an agent. The 5 announcements are periodically updated to reassure customers that they are progressing in the queue. The customers are also given the opportunity to leave a message if they do not wish to wait in the queue.

10 While the prior art describes a method for enabling a caller to arrange, prior to a call, for access to a priority queuing arrangement, there is need for a system which will enable a caller to alter his/her position in a phone queue. For instance, a caller's data processing 15 system may have become inoperative, resulting in a virtual shutdown of the related business. Applicants know of no provision in the prior art for enabling a caller who is placed in a phone queue to arrange for any movement within the queue.

20

#### SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide a phone queuing system and method which enables a 25 caller to move his/her call position in a queue.

It is another object of this invention to provide a system and method for enabling a PBX/ACD system to offer to incoming callers the ability to change their positions 30 within a queue in which their respective calls have been placed.

In accordance with the invention, a PBX/ACD system allows callers to exercise control over their rank order 35 within a phone queue. The ACD accesses a call database and develops offers to be made to callers, based upon a caller reaching a particular position in a queue or at a position at which the call is first placed in the queue. An IVRU is employed to offer a caller a chance to move up in the queue 40 in return for a payment. If the caller wishes to accept

the offer, the caller responds by using the touch tone keys of his/her telephone and entering a credit card number, an account number, or indicating some other method of payment.

The ACD then changes the rank order of the caller's call 5 within the phone queue and alters the rank position of other calls within the queue, accordingly.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is a block diagram illustrating a priority phone queuing system that incorporates the invention.

Fig. 2 is a block diagram of a private branch exchange (PBX).

15 Fig. 3 is a block diagram of an automatic call distributor (ACD).

Fig. 4a is a schematic drawing showing a call order 20 database maintained within the PBX of Fig. 2.

Fig. 4b is a schematic drawing of an offer database maintained within the ACD of Fig. 3.

25 Fig. 4c is a schematic drawing of an acceptance database located within the ACD of Fig. 3.

Fig. 5 is a flow chart illustrating the process by which calls are processed in rank.

30 Fig. 6 is a flow chart describing the process by which offers for position upgrades in a queue are created and delivered to a caller.

Fig. 7 is a continuation of the flow chart of Fig. 6.

Fig. 8 is a flow chart describing the process by which calls are repositioned in a queue.

40 DETAILED DESCRIPTION OF THE INVENTION

Referring to Fig. 1, a priority phone queuing system comprises a PBX 10, an ACD 12 and an IVRU 14. PBX 10 receives incoming calls and is, in turn via a trunk 20, connected to a plurality of agent terminals 16. In the description which follows, it will be assumed that all agent terminals 16 are busy and that PBX 10 cannot respond to an incoming call by making a direct connection to an agent. As a result, PBX 10 is forced to place an incoming call on hold and to provide call data to ACD 12. In response, ACD 12 places the incoming call in a queue, in the order received. Thereafter, when PBX 10 determines that an agent terminal is available, it so instructs ACD 12 which provides the next call at the top of the queue back to PBX 10, which then takes the corresponding incoming line off hold and connects the caller to the available agent.

After the call has been listed in the queue and in accord with preset criteria, ACD 12 instructs IVRU 14 to make a queue movement offer to a caller and to await a response thereto from the caller. If IVRU 14 receives an acceptance of the queue movement offer, it records the caller's identifier and payment information, e.g., account number, credit card number, etc... and provides that information to ACD 12. In response, ACD 12 moves the call to a new rank within the call queue and the process continues.

IVRU 14 can be instructed by ACD 12 to make the queue movement offers either upon initial queuing of a call, when a call reaches an Nth position in a queue, periodically, or upon some other basis chosen by the user.

Turning to Fig. 2, PBX 10 comprises a conventional switch network 24 which receives incoming calls via trunk 26 and provides outgoing connections to various ones of agent terminals 16 (Fig. 1) via trunk 20. Control of switch network 24 is exerted by central processing unit (CPU) 30 which is, in turn, controlled by procedures stored in random access memory (RAM) 32 and read-only memory (ROM)

34.

Control procedures and databases used by CPU 30 are held in data storage device 36 (e.g. a hard disk drive).  
5 Stored therein are a transaction processor routine 38, a routing database 40 and an agent database 42. CPU 30 is connected to receive input from a conventional clock 33. Transaction processor routine 38, when downloaded to RAM 32, enables handling of incoming calls and control of  
10 switch network 24. Routing database 40 maintains the necessary internal routing information regarding agent terminals 16 (and any other terminals that are connected to PBX 10). Agent database 42 provides further information regarding each agent terminal and is utilized to enable the  
15 routing of control signals and telephone calls between PBX 10 and the individual agent terminals.

PBX 10 controls communications with each of agent terminals 16 via an agent interface 44 and a communication port 46, with the signalling occurring over control wiring (not shown) between the PBX and the agent terminals. The signalling may, in the alternative, be carried on the internal telephone network. An ACD interface 48 enables PBX 10 to communicate with ACD 12 (shown in Fig. 3).

25 Referring to Fig. 3, ACD 12 is controlled by a CPU 52 and includes a clock 55, a ROM 53 and a RAM 54, the latter of which maintains a queue 56 (or queues) of calls awaiting connection to an agent terminal 16. A data storage device 58 includes a transaction processor 60 that enables handling of queue 56 and other functions performed by ACD 12, to be hereafter described. Data storage device 58 further includes a call database 62, an offer database 64 and an acceptance database 66, all of which will be  
30 hereafter described in conjunction with the schematic illustrations of Fig. 4a-4c. ACD 12 communicates with PBX 10 via communication port 68 and PBX interface 70, and with IVRU 14 via IVRU interface 72.  
35

40 It is to be understood that PBX 10, ACD 12 and IVRU 14

are all commercially available units. For instance, the Ameritech Corporation's Call Center provides automated call attendant functions, automatic call distributor functions and interactive voice response functions.

5

Turning now to Figs. 4a-4c, three databases which are schematically illustrated aid in the implementation of the invention. Call database 62 (Fig. 4a) includes a listing of the calling phone number; a call tracking number; a call rank value which indicates the position of the call within a call queue; the time the call was received; an offer tracking number and an acceptance tracking number which enables cross references to other databases.

15 Offer database 64 includes, for each call, an entry for a call tracking number for the call; the phone number of the caller; an offer tracking number; an offer description indicator; a time of offer value and an entry indicating the number of offers made to the caller.

20

Acceptance database 66 includes, for each call, a call tracking number; the phone number of the caller; an offer tracking number; an indicator regarding payment method; payment data indicating the amount; and the time of offer acceptance.

30 The data contained within call database 62, offer database 64 and acceptance database 66 are employed to enable ACD 12 and IVRU 14 to determine to which callers a queue movement offer should be made; when the offer should be made; what the offer should be; and to handle the response of the caller to an offer.

It will be understood that the above-described  
35 databases are intended to illustrate one embodiment of the present invention. Many alternative database structures and methods of performing the desired functions will be apparent to those skilled in the art.

40 Referring to the flow diagrams of Figs. 5-8, the

procedure employed by the invention will be described. When a call is received by PBX 10 (box 100), PBX 10 determines the callee's telephone number, i.e., extension (box 102) and identifies the route thereto by accessing a 5 dialed number identification service (DNIS) (box 104). Once the routing information is obtained from the DNIS, (box 106), the call is put on hold and data regarding the call is routed to ACD 12 (box 108).

10       ACD 12 logs the call and updates its call database (box 110), by establishing an entry for the call, placing the call in call queue 56, and recording the necessary data in call database 62. Thereafter, a rank, or queue position, upgrade offer is created, which in the present 15 embodiment is based upon (i) the position of the call in call queue 56 (i.e., call rank) and (ii) the estimated wait time before the call is expected to be answered (box 112).

The queue position upgrade offer tells the caller that a repositioning will be made of the call in the queue to a 20 higher rank, upon acceptance by the caller of the offer and indication of a willingness to make the required payment.

Once the queue position upgrade offer is created, ACD 12 instructs PBX 10 to take the call off hold (box 114) and 25 send the queue position upgrade offer to IVRU 14 (box 116).

IVRU 14 then transmits (through PBX 10 and ACD 12) the offer to the holding call line (box 118).

Thereafter, IVRU 14 captures the customer response 30 either accepting or declining the offer (box 120). The acceptance/rejection of the offer is then transmitted to ACD 12 (box 122). If the offer has been accepted by the caller (decision box 124), the acceptance is stored in acceptance database 66 (box 126). If the offer has been 35 declined, another offer is created and sent to the caller (box 128). The new offer will generally await the expiration of an additional time period, at which time it will be dispatched to the caller and the process will then repeat.

Assuming acceptance of the offer, ACD 12 receives the acceptance data from IVRU 14 (box 130) and assigns a new rank to the call (box 132). The new rank is stored in the call order database (box 134) and the call is moved up to 5 the new rank position in queue 56 (box 136).

The above description has assumed that the call will be moved ahead in position in the same queue. An alternative is to move the call from the queue in which it 10 is positioned to a priority queue where there is a guarantee of response within a set of period of time. For example, a customer waiting for technical support can be offered the option of waiting for a company's own representatives (for which there is no charge), or can be 15 switched to an outside private service where there is a guarantee of a response in less than a predetermined time, but requiring a charge for the service.

It will be understood that the offer terms are 20 selected dependent on the circumstances of a given calling situation. For example, in customer service situations where the work flow of a caller may be dependent on the information to be obtained through the call, offers to change position in the queue may be made on a frequent 25 basis and for a significant charge. A graduated fee may be provided from which a caller may select one of many available positions in the queue. An emergency option may be offered wherein, for a predetermined charge, a caller is guaranteed to be moved to the next in line for a response.

30

In situations where a change in position may not be as desirable to a caller, offers to change position may be made less frequently and/or for a lesser charge.

35

In yet another embodiment of the present invention, callers may be offered an option to bid for a desirable position in the calling queue. For example, in a situation where a limited number of sporting event tickets are made available for sale by telephone, callers may be offered an 40 option to bid on a relative position within the queue. In

such circumstances, while the cost of the tickets may be relatively low, ticket availability will still be limited to those whose position in the queue permit their purchase before they are sold out. In such circumstances, callers 5 may wish to exercise an option to bid on a more desirable position within the queue.

It will be apparent that an almost infinite variety of terms can be used to implement the offer, depending on the 10 particular purpose to be suited.

It will further be understood that the hardware implementation of the system may be varied, depending on the environment. In any event, irrespective of the hardware 15 configuration, the functions described above need to be accomplished to carry out the invention. For example, the PBX may be entirely omitted if the PBX functionality is incorporated into the VRU or the ACD. Thus, incoming calls could go directly to the VRU, which would be, in turn, 20 connected to the ACD or vice-versa.

It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those 25 skilled in the art without departing from the invention. For instance, performance of the invention may be accomplished under software control which is loaded from one or more media disks, with the media disks including the necessary code to cause processing means to carry out the 30 invention. Accordingly, the present invention is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.

CLAIMS

1. An apparatus for call processing, comprising:
  - a PBX operative to receive a call;
  - 5 a voice response unit operative to receive a request for an earlier answer for the call; and
    - an automatic call distributor operative to direct the PBX to answer the call within a first time period if the voice response unit does not receive a request for an earlier answer for the call, and
      - 10 answer the call within a second time period that is shorter than the first time period if the voice response unit receives a request for an earlier answer for the call after the PBX receives the call.
- 15
2. An apparatus for call processing, comprising:
  - a PBX operative to receive a call;
  - a voice response unit operative to transmit an upgrade offer and receive a response to the upgrade offer; and
    - 20 an automatic call distributor operative to direct the PBX to
      - answer the call within a first time period if the response does not indicate an acceptance of the upgrade offer and
      - 25 answer the call within a second time period that is shorter than the first time period if the response indicates an acceptance of the upgrade offer.
3. An apparatus for call processing, comprising:
  - a PBX operative to receive a call;
  - 30 an automatic call distributor operative to place the call in a queue;
  - a voice response unit operative to transmit an upgrade offer and receive an acceptance of the upgrade offer; and
    - 35 wherein the automatic call distributor is further operative to move the call up in the queue in response to a received acceptance, thereby moving the call closer to a top of the queue.
- 40 4. An apparatus for call processing, comprising:

a PBX operative to receive a call;  
an automatic call distributor operative to place the call in a queue, the call having a position in the queue;  
a voice response unit operative to transmit an upgrade offer and receive an acceptance of the upgrade offer; and  
wherein the automatic call distributor is further operative to reposition the call in the queue to a higher rank in response to a received acceptance.

10 5. An apparatus for call processing, comprising:  
a PBX operative to receive a call;  
an automatic call distributor operative to place the call in a queue, the call having a position in the queue;  
a voice response unit operative to transmit an upgrade offer and receive an acceptance of the upgrade offer; and  
wherein the automatic call distributor is further operative to alter the position of the call in the queue such that the call may be answered in a shorter period of time than if the position had not been altered.

20 6. An apparatus for call processing, comprising:  
a PBX operative to receive a call;  
an automatic call distributor operative to place the call in a queue;  
a voice response unit operative to transmit an upgrade offer while the call is in the queue, and receive an acceptance of the upgrade offer while the call is in the queue; and  
wherein the automatic call distributor is further operative to move the call from the queue to a priority queue in response to the acceptance, the priority queue having a guarantee of response within a predetermined time.

7. A method for call processing, comprising:  
35 receiving a call;  
if a request for an earlier answer for the call is not received,  
answering the call within a first time period;  
and  
40 if a request for an earlier answer for the call is

received after the step of receiving the call,  
answering the call within a second time period  
that is shorter than the first time period.

5 8. A method for call processing, comprising:  
receiving a call;  
transmitting an upgrade offer;  
receiving a response to the upgrade offer;  
if the response does not indicate an acceptance of the  
10 upgrade offer,

answering the call within a first time period;

and

if the response indicates an acceptance of the upgrade  
offer,

15 answering the call within a second time period  
that is shorter than the first time period.

9. A method for call processing, comprising:

receiving a call;

20 placing the call in a queue;  
transmitting an upgrade offer;  
receiving an acceptance of the upgrade offer; and  
moving the call up in the queue in response to the  
received acceptance, thereby moving the call closer to a  
25 top of the queue.

10. A method for call processing, comprising:

receiving a call;

30 placing the call in a queue, the call having a  
position in the queue;

transmitting an upgrade offer;

receiving an acceptance of the upgrade offer; and  
repositioning the call in the queue to a higher rank.

35 11. A method for call processing, comprising:

receiving a call;

placing the call in a queue, the call having a  
position in the queue;

transmitting an upgrade offer;

40 receiving an acceptance of the upgrade offer; and

altering the position of the call in the queue such that the call may be answered in a shorter period of time than if the position had not been altered.

5 12. A method for call processing, comprising:  
receiving a call;  
placing the call in a queue;  
transmitting an upgrade offer while the call is in the queue;

10 receiving an acceptance of the upgrade offer while the call is in the queue; and  
moving the call from the queue to a priority queue in response to the acceptance, the priority queue having a guarantee of response within a predetermined time.

15

13. An automatic call distributor operative in combination with a voice response unit to process received calls, comprising:  
a) means for arranging call identifiers in a queue in dependence upon a time of receipt of calls corresponding thereto;

20 b) means, operational in accord with predetermined criteria, for outputting a message transmission signal which causes said voice response unit to provide a message to a caller, the caller having a call identifier in said queue, said message offering an option for the caller's call to be moved in said queue in exchange for a payment; and

25 c) means responsive to said means b) indicating said caller's acceptance of said offer, by moving said caller's call identifier in said queue so as to enable for said caller's call to be answered in a shorter period of time than if the offer had not been accepted.

35 14. The automatic call distributor as recited in claim 13, wherein said predetermined criteria is determined by said means b) measuring a time delay before a response is expected to be available for said call corresponding to a call identifier; and if the time delay expected before a

40 response exceeds a time delay threshold, signaling said

voice response unit to present said message to said caller.

15. The automatic call distributor as recited in claim 13,  
wherein said predetermined criteria is based on a rank  
5 position of said call identifier in said queue and if the  
rank position of said call exceeds a preset value,  
signaling said voice response unit to present said message  
to said caller.

10 16. The automatic call distributor as recited in claim 13,  
wherein said predetermined criteria is based on (i) a time  
delay anticipated before a response is expected to be  
available for said call corresponding to a call identifier  
and (ii) a determining of a rank position of said call in  
15 said queue; and  
if the time delay expected before a response exceeds a time  
delay threshold or if the rank position of said call  
identifier exceeds a preset value, signaling said voice  
response means to dispatch said message to said caller.

20 17. The automatic call distributor as recited in claim 13,  
wherein said means c) places said call in a further queue  
which assures an earlier response to said call.

25 18. An apparatus for processing received calls,  
comprising:  
call distribution means for arranging call identifiers in a  
queue in dependence upon a time of receipt of calls  
corresponding thereto and operational in accordance with  
30 predetermined criteria, for outputting a message  
transmission signal;  
voice response means operative in accord with said message  
transmission signal from said call distribution means, for  
providing a message to a caller whose call identifier is  
35 present in said queue, said message offering an option for  
the caller's call to be assured of an earlier response in  
exchange for a payment, and for informing said call  
distribution means of said caller's acceptance of said  
offer; and  
40 said call distribution means responsive to said informing

for moving said caller's call identifier in said queue so as to enable said caller's call to be answered in a shorter period than if the offer had not been accepted.

5 19. The apparatus as recited in claim 18, wherein said predetermined criteria is determined by said call distribution means measuring a time delay before a response is expected to be available for said call corresponding to a call identifier; and said voice response means is  
10 operative to present said message to said caller if the time delay expected before a response exceeds a time delay threshold.

20. The apparatus as recited in claim 18, wherein said predetermined criteria is determined by said call distribution means determining a rank position of said call in said queue and said voice response means is operative to present said message to said caller if the rank position of said call exceeds a preset value.  
15

21. The apparatus as recited in claim 18, wherein said predetermined criteria is determined by said voice response means offering to all callers an option to bid against other callers for relative position within said queue.  
20

22. The apparatus as recited in claim 18, wherein said call distribution means places said call identifier in a further queue which assures an earlier response to said call.  
25

23. The apparatus as recited in claim 18, wherein said call distribution means places said call identifier at a position in said queue that assures an earlier response.  
30

35 24. A method for processing calls in a telephone system, comprising the steps of:  
a) arranging call identifiers in a queue in dependence upon a time of receipt of calls corresponding thereto;  
b) in accord with a criteria, providing a message to a  
40 caller, whose call identifier is present in said queue,

said message offering an option for the caller's call to be assured of an earlier answer in exchange for a payment; and  
5 c) responding to said caller's acceptance of said offer by arranging for said caller's call to be answered in a shorter period than if the offer had not been accepted.

25. The method as recited in claim 24, wherein step b) comprises the further steps of:

10 b1) measuring a time delay expected before a response is expected to be available for said call corresponding to a call identifier; and

b2) if the time delay expected before a response exceeds a time delay threshold, presenting said message to said caller.

15

26. The method as recited in claim 24, wherein step b) comprises the further steps of:

b1) determining a rank position of said call in said queue; and

20 b2) if the rank position of said call exceeds a preset value, presenting said message to said caller.

27. The method as recited in claim 24, wherein step b) comprises the further step of:

25 b1) offering to said caller an option to bid against other callers for a relative position within said queue.

28. The method as recited in claim 24, wherein step c) 30 further comprises:

c1) placing said call identifier at a position in said queue that assures an earlier response.

29. The method as recited in claim 24, wherein step c) 35 comprises the further steps of:

c1) placing said call in another queue which assures an earlier response to said call.

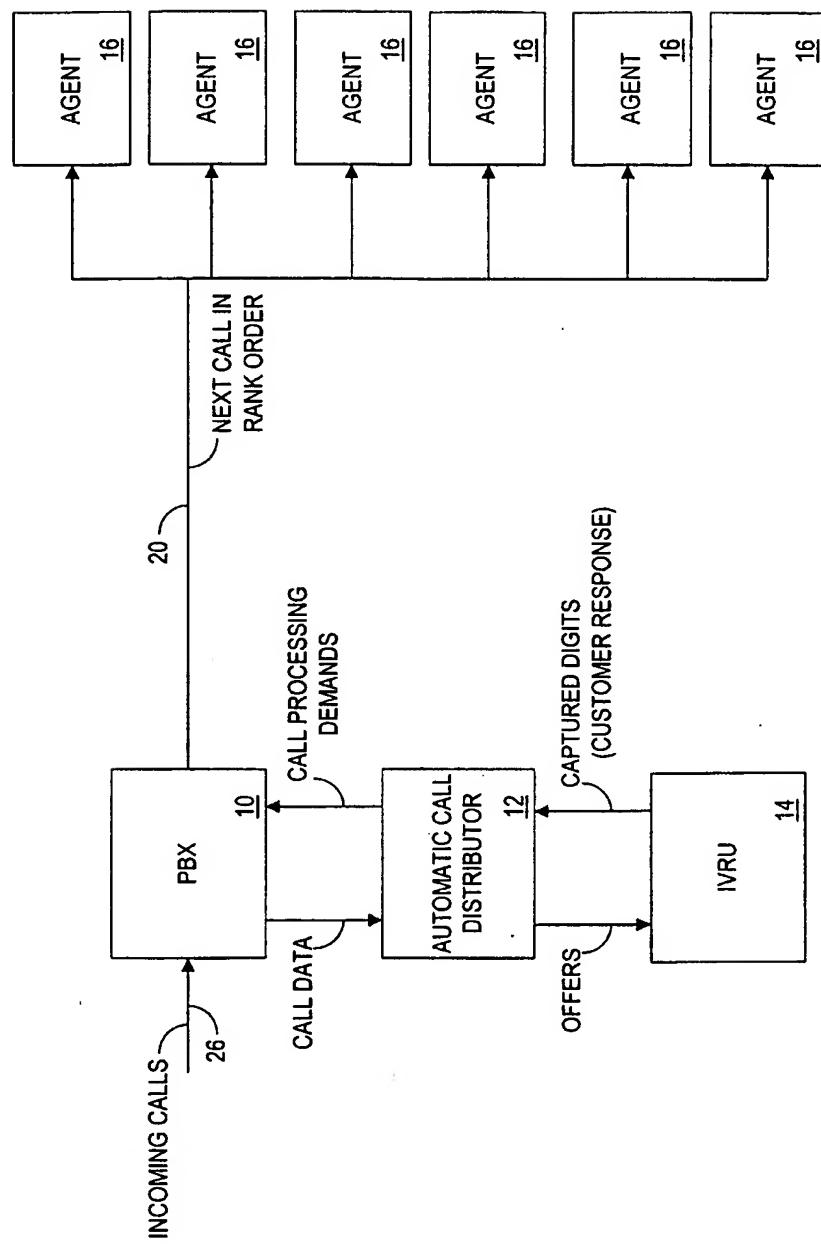


FIG. 1

SUBSTITUTE SHEET ( rule 26 )

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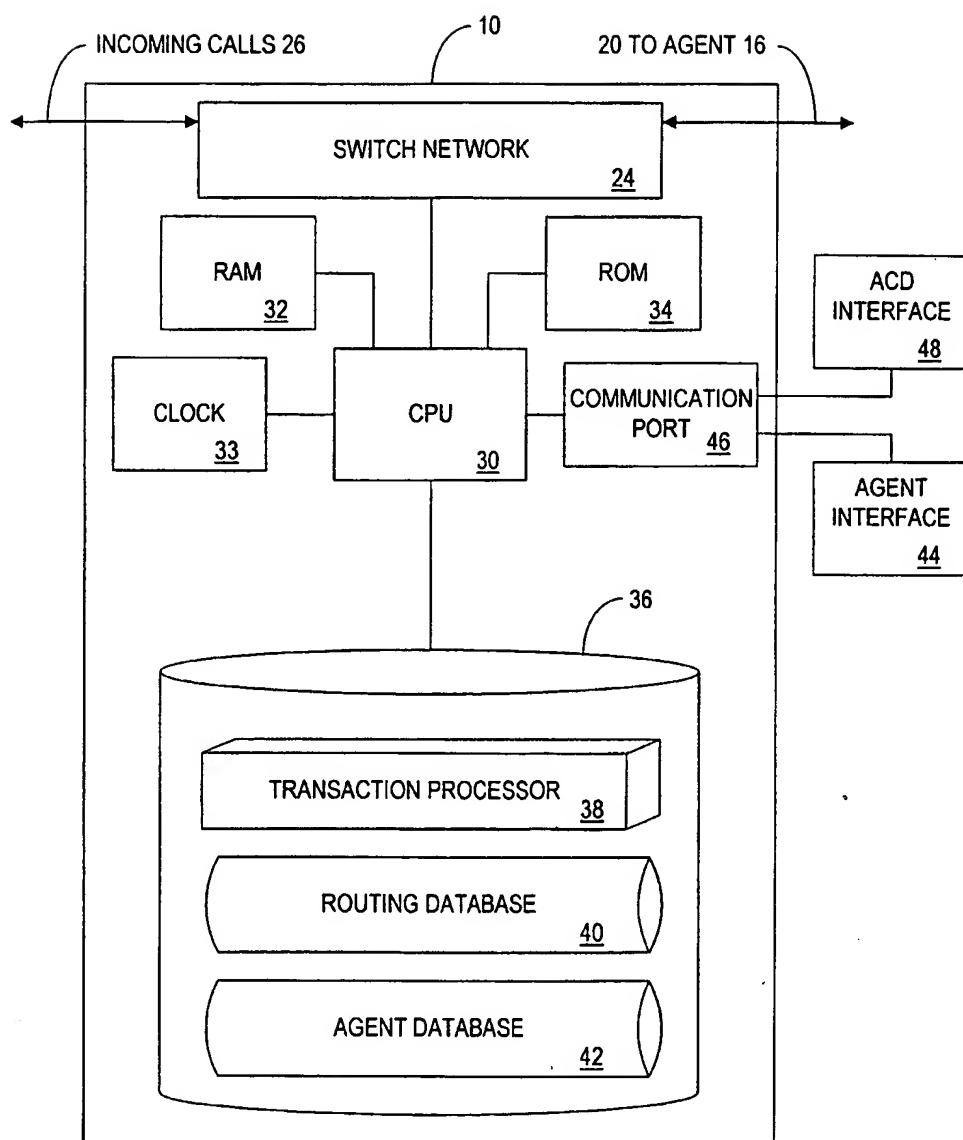


FIG. 2

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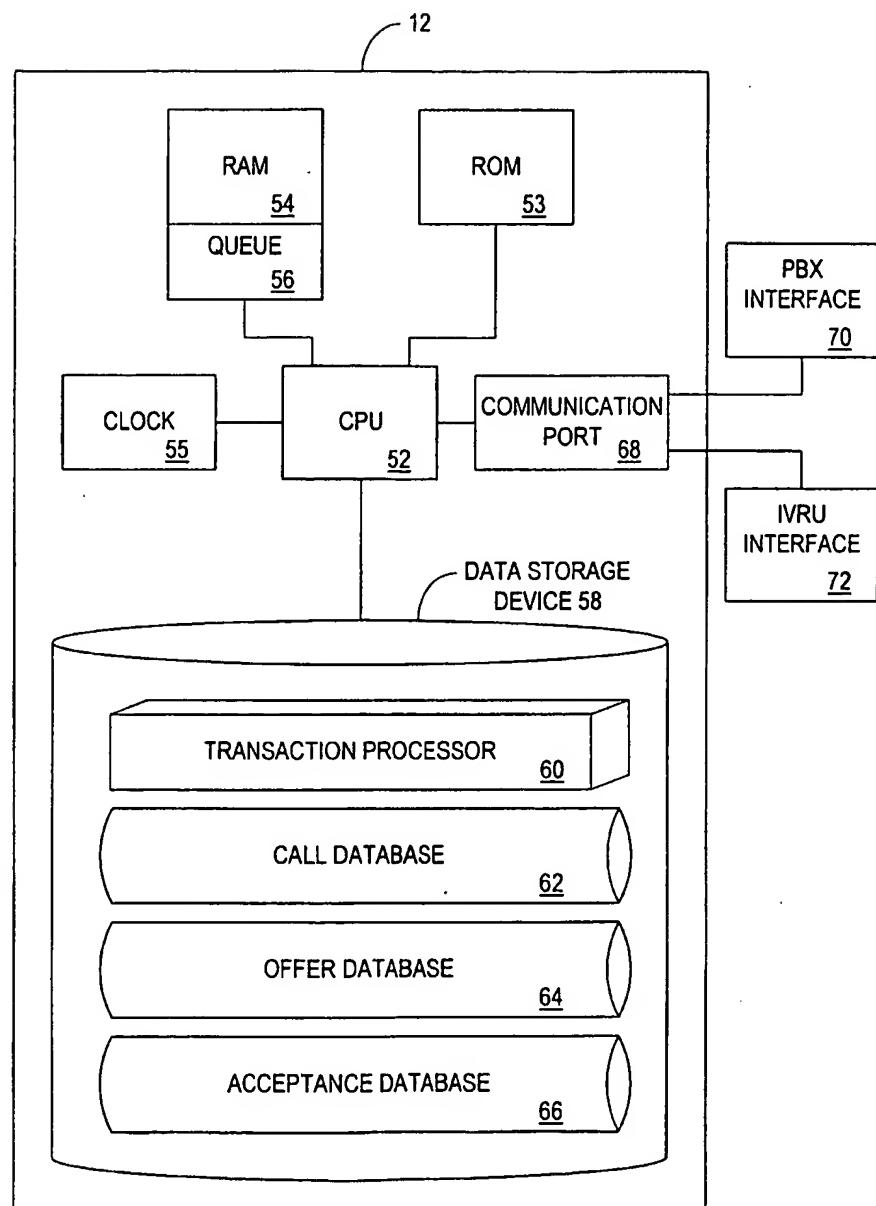


FIG. 3

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CALL DATABASE 62

PHONE NUMBER	CALL TRACKING NUMBER	CALL RANK	TIME RECEIVED	ACCEPTANCE TRACKING NUMBER	OFFER TRACKING NUMBER

FIG. 4A

OFFER DATABASE 64

CALL TRACKING NUMBER	PHONE NUMBER	OFFER TRACKING NUMBER	OFFER DESCRIPTION	TIME OF OFFER	NUMBER OF OFFERS MADE

FIG. 4B

ACCEPTANCE DATABASE 66

CALL TRACKING NUMBER	PHONE NUMBER	OFFER TRACKING NUMBER	PAYMENT METHOD	PAYMENT DATA	TIME OF OFFER ACCEPTANCE

FIG. 4C

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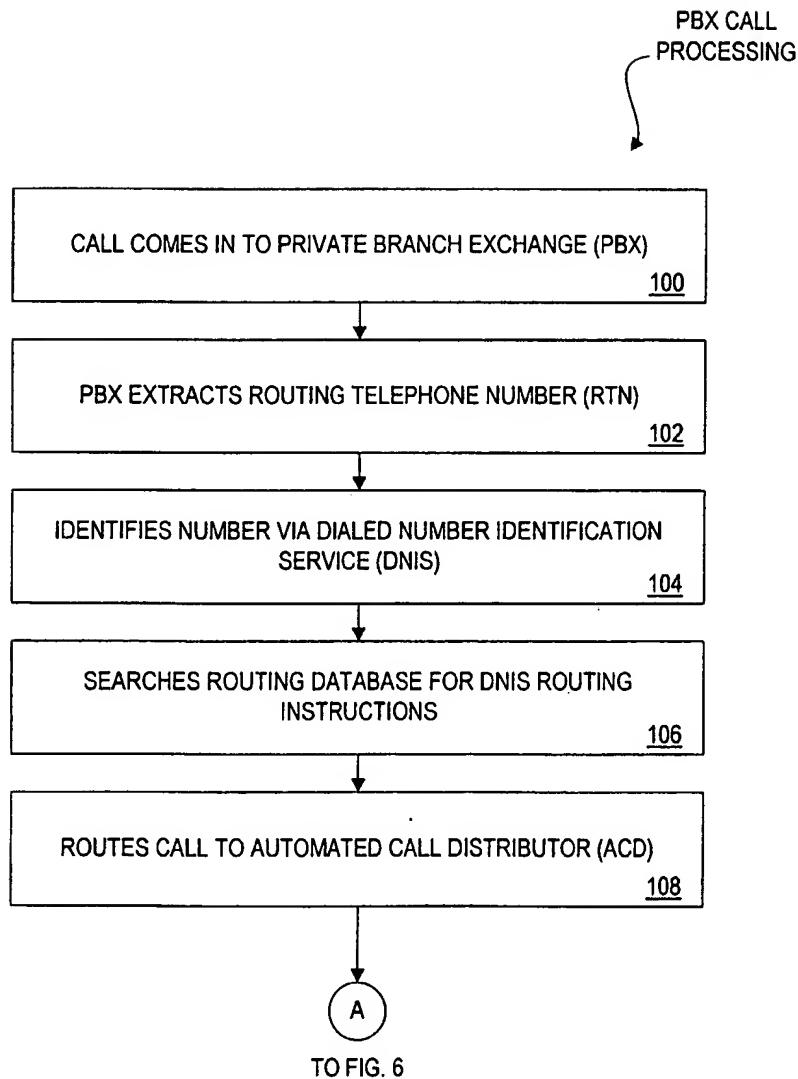


FIG. 5

SUBSTITUTE SHEET ( rule 26 )

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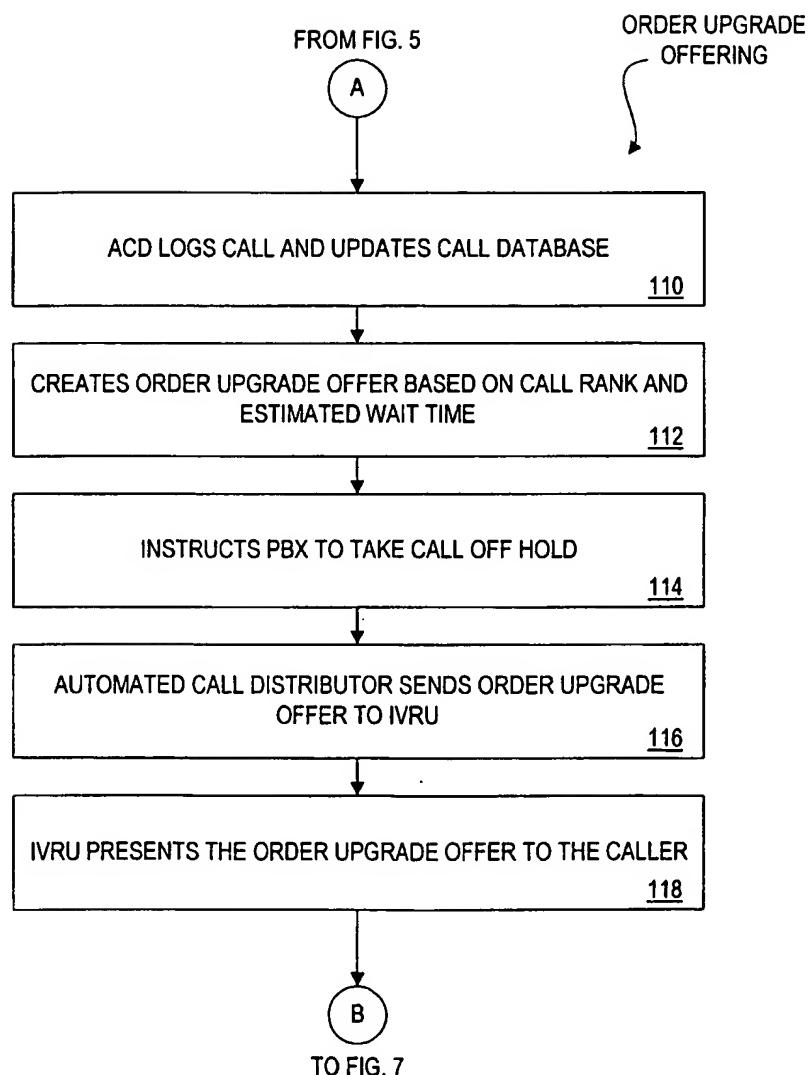


FIG. 6

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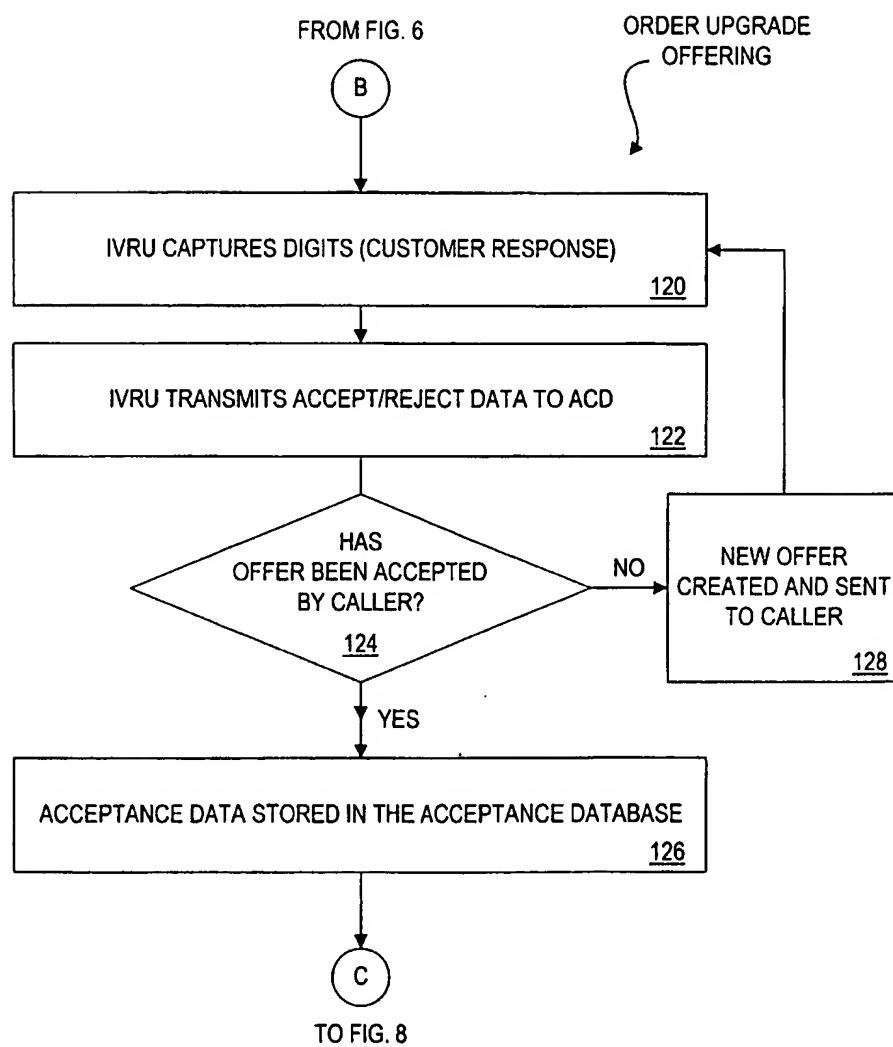


FIG. 7

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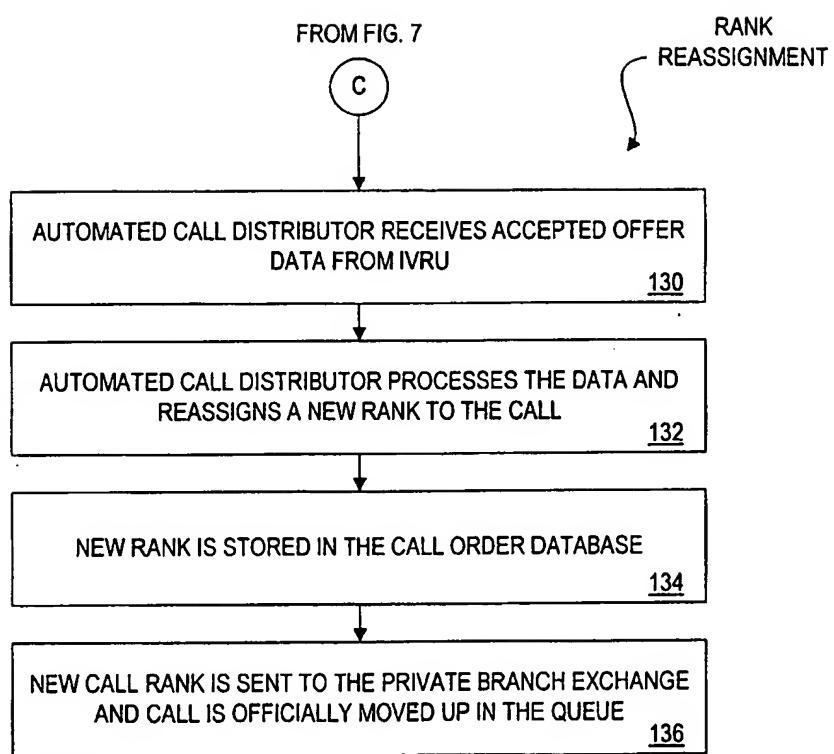


FIG. 8